maintained at a level for full or near full back emf in the armature windings (claim 9). This is unlike previous field coil flywheel systems such as Clifton that have relied on rapid ramping current capability to the field coil in order to quickly respond to an interruption of power. Applicant's claimed flywheel energy storage systems do not require rapid ramping of field coil current to a field coil when a power interruption occurs because the field flux is maintained at a flux intensity sufficient to ensure generation of full power instantly from the moment of primary power interruption, without any delay or lag whatsoever.

Clifton (Patent No. 5,932,935) discloses an inductor alternator flywheel system in which primary power from the grid is monitored by a monitoring system and, when an interruption to primary power is detected, the current to the field coil is rapidly ramped up to extract stored power from the flywheel energy storage system. (See column 16, line 33-41.) Thus, when primary power is interrupted, there is short period of interruption to output power before Clifton's flywheel can commence delivering full output power. Applicant's invention as disclosed in detail in the specification, and as defined in claims 1 and 9, does not suffer from this delay. Thus, claims 1 and 9 are not anticipated by Clifton.

Claims 2-8 and 10-20 have been rejected under 35 USC 103 as unpatentable over Clifton in view of Patent No. 4,656,576 to Kawarabayashi.

Applicant respectfully traverses the rejection of claims 2-8 and 10-20 as unpatentable over the combination of Clifton and Kawarabayashi on the ground that the combination would not have been obvious to a person or ordinary skill in the art, and that even if it had been obvious, it would not have resulted in a flywheel energy storage system within the scope of claims 2-8 and 10-20. These claims and the applied references will be discussed in detail below.

Kawarabayashi (Patent No. 4,656,576) discloses a control system for a vehicle testing dynamometer. It is unrelated to a flywheel energy storage system for providing power protection. Instead it is a control system for rapidly testing a motor vehicle by controlling a field current to a dynamometer so that the dynamometer can provide the force to absorb the output from the vehicle. It does not teach the benefits of its use to the flywheel energy storage field, so there is no reason why a person of ordinary skill in

the art, reading either Clifton of Kawarabayashi would have been motivated to use the Kawarabayashi disclosure to modify Clifton.

Even if a person of ordinary skill in the art were to use the teachings in Kawarabayashi to modify Clifton "for the purpose of providing a measured speed value of a shaft to a controller and an error function generator circuit, so that the integrated value of an error between a predicted output value and the desired value becomes zero" as the Examiner asserts would have been obvious, it still would not produce an energy storage system within the scope of claim 2-8 and 10-20 because it would still have resulted in the need to ramp up the power to the field coil of Clifton, which is the inherent problem the Clifton suffers from. The delay in the production of full output power from Clifton would still exist, and therefore the combination of these two references would not provide a flywheel energy storage system that was within the scope of claims 2-8 and 10-20.

Claims 2 and 19 call for a flywheel energy storage system in which the field controller includes a speed sensor for monitoring rotational speed of the flywheel, and varying electrical power to the field coil to maintain a substantially constant back emf in the armature windings during an interruption of the primary power. It should be noted that claim 2 deals with the operation of Applicant's invention *during* the period of the interruption. The avoidance of the delay in full output power at the beginning of the interruption is provided by the invention defined in parent claim 1. As energy is extracted from the flywheel during the interruption in primary power according to the system defined in claim 2, the flywheel speed slows and this slowing is detected by the speed sensor which signals the controller to increase the current to the field coil to maintain the output at a steady level.

Kawarabayashi's dynamometer control system does indeed have a speed sensor that is used to control the force applied by his dynamometer to absorb the force output of the vehicle being tested. This is not a teaching of using a speed sensor to control current to a field coil in a flywheel energy storage system to maintain the electrical power output of the flywheel energy storage system at a constant level. A person of ordinary skill in the flywheel art would not be expected to look to the braking force controls in the dynamometer art for a teaching of controls that would provide for a constant electrical power outlet from a flywheel electric generator. Even if he did

consider Kawarabayashi's disclosure, there is nothing in either reference that would induce a person of ordinary skill in the art to control current to a field coil in a flywheel energy storage system to maintain the electrical power output of the flywheel energy storage system at a constant level at the moment of power interruption, since neither nor Clifton recognize the problem. Moreover, there is no teaching how to actually apply Kawarabayashi's teaching to use the speed signal to control power outlet from a flywheel electric generator at a constant level at the moment of power interruption. Accordingly, Applicant believes that claims 2 and 19 are patentable over the combination of Clifton and Kawarabayashi.

Claims 4, 7-8, 11-12, 14-17 and 20 have been rejected on the general proposition that "discovering an optimum value of a result effective variable involves only routine skill in the art." In claims 4, 12, and 17, the field coil is defined having a weight Wfc in pounds, and the flywheel is defined having has a weight Wfw in pounds, wherein Wfc/Wfw > 0.25. There is no cited prior art dealing with the ratio of the weights of the field coil and the flywheel, in part because the cited prior art does not recognize the significance of this ratio in the design of flywheel energy storage systems that have a constant output without a lag or delay when a power interruption in primary power occurs. Thus, the general proposition above cited by the Examiner does not apply when the prior art does not teach the significance of the variable in the first place.

Claim 7, 11 and 20 call for a field coil weight Wfc in pounds, and a flywheel energy storage system 15 second output power capability P in kilowatts, wherein Wfc/P > 0.60. The cited references fail to recognize the significance of the ratio of field coil weight and flywheel output capacity in the design of flywheel energy storage systems that have a constant output without a lag or delay when a power interruption in primary power occurs. Accordingly, the general proposition above cited by the Examiner does not apply when the prior art does not teach the significance of the variable in the first place.

Claim 8, 14, 15 and 16 calls for a field coil having an inductance Ifc, and armature windings having an individual phase inductance Iap, wherein Ifc/Iap> 25,000 or 100,000. The cited references fail to recognize the significance of the ratio of field coil inductance and individual phase inductance of the armature windings in the design of flywheel energy storage systems that have a constant output without a lag or delay

when a power interruption in primary power occurs. Accordingly, the general proposition above cited by the Examiner does not apply when the prior art does not teach the significance of the variable in the first place.

Claims 3, 5-6, 13 and 18-19 have been rejected under 35 USC 103 as unpatentable over Clifton in view of Kawarabayashi. The Examiner asserts that Clifton and Kawarabayashi discloses the elements claimed in claims 3, 5-6, 13 and 18-19, but the Examiner has made no attempt to explain how a person of ordinary skill in the art would combine these elements, or why. A person of ordinary skill in the art does not make random modifications in the prior art; he requires some motivation to focus his attention on a particular improvement that is taught to be available by making the suggested modification. There is no such teaching in the cited references that would provide such a motivation. Moreover, Clifton's system has three magnetic air gaps, not a single magnetic air gap between two surfaces of the rotor that rotate together claimed and containing the armature as claimed in claims 5, 6, 13 and 18.

Accordingly, Applicant believes that the claims now pending in this Application are patentable over the references noted above. If the Examiner concurs, he is respectfully invited to pass this Application to issue.

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